



Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/12

Paper 1 Multiple Choice (Core)

October/November 2023

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

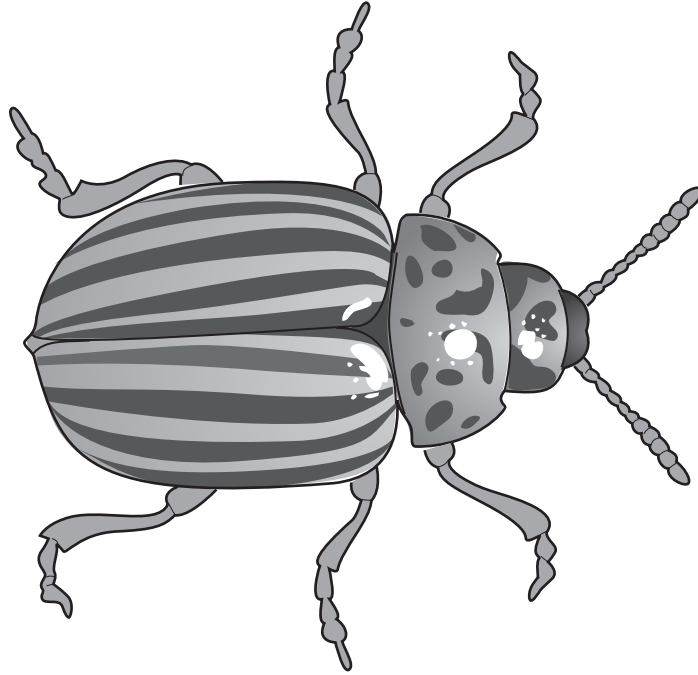
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1 Which statement about the characteristics of living organisms is correct?
- A Excretion is the removal of excess substances and toxic materials.
 - B Movement is the ability to detect and respond to environmental changes.
 - C Nutrition is the breaking down of molecules to release energy.
 - D Respiration is the manufacture of carbohydrates from raw materials.
- 2 The diagram shows a beetle.



The length of the diagram is 75 mm.

The actual length of the beetle is 5 mm.

What is the magnification?

- A $\times 5$ B $\times 15$ C $\times 80$ D $\times 375$

- 3 A colourless liquid gives the test results shown.

test	colour obtained
Benedict's	blue
biuret	purple
iodine	blue / black

Which nutrients are in the colourless liquid?

- A** protein, reducing sugar and starch
B protein and reducing sugar only
C protein and starch only
D protein only
- 4 Which type of molecule are enzymes?
- A** carbohydrate
B fat
C protein
D starch
- 5 Which conditions cause the highest rate of transpiration in a plant?

	temperature	wind speed
A	high	high
B	high	low
C	low	high
D	low	low

- 6 Which row provides the greatest amount of the nutrient needed to move food through the alimentary canal?

	nutrient content / 100 g			
	calcium / mg	fibre / g	protein / g	sugar / g
A	36.0	5.1	9.0	24.8
B	35.0	2.8	3.3	20.0
C	46.0	10.9	9.0	0.8
D	8.5	0.0	28.0	0.0

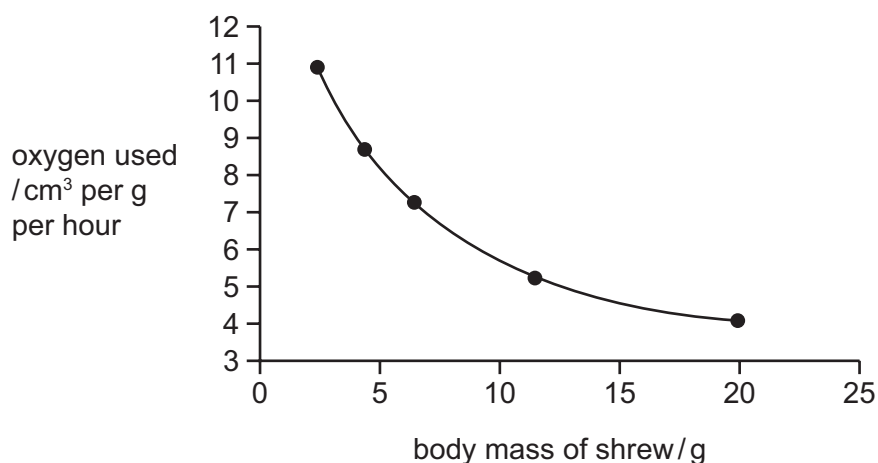
- 7 The rates of water uptake and loss are measured in four leaves. The results are shown in the table.

Which leaf is least likely to wilt?

	rate of water uptake /mm ³ per minute	rate of water loss /mm ³ per minute
A	8	15
B	9	11
C	12	13
D	15	10

- 8 Small mammals need more energy to maintain a constant body temperature.

The graph shows the rate of oxygen used by species of shrews with different body masses.

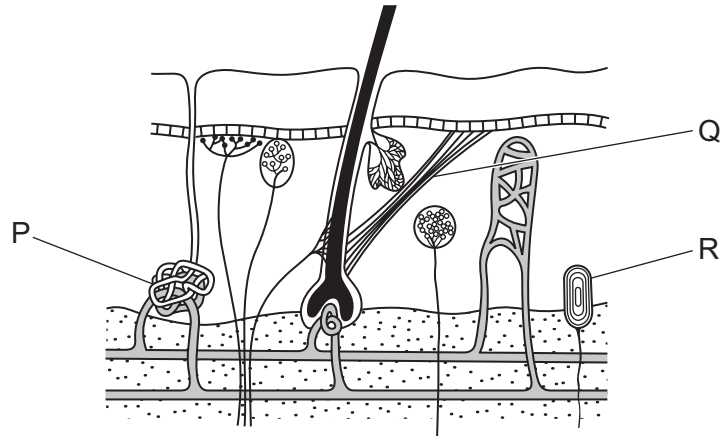


Which statements are correct?

- 1 Heavier shrews use oxygen more slowly than lighter shrews.
- 2 Heavier shrews respire faster than lighter shrews.
- 3 Heavier shrews lose heat more slowly than lighter shrews.

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

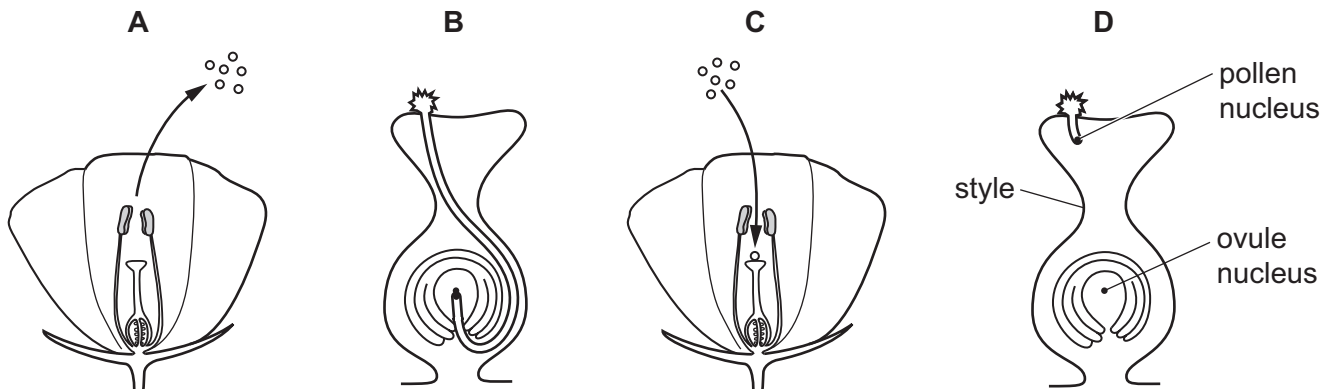
9 The diagram shows a section through the skin.



Which row contains the correct names of the structures labelled P, Q and R?

	P	Q	R
A	sweat gland	hair	blood vessel
B	receptor	hair	receptor
C	sweat gland	hair erector muscle	receptor
D	receptor	hair erector muscle	blood vessel

10 Which diagram shows fertilisation occurring in a flower?



11 Which term describes differences between individuals of the same species?

- A** competition
- B** generation
- C** selection
- D** variation

12 Which type of organism gets its energy from breaking down dead or waste organic matter?

- A** carnivore
- B** consumer
- C** decomposer
- D** producer

13 The concentration of carbon dioxide in the atmosphere has increased during the last 200 years.

What has contributed to this increase?

- A** burning large areas of forest
- B** increasing use of pesticides
- C** planting more crops
- D** using fewer fossil fuels

14 A sample of water contains two useful substances, insoluble chalk and a soluble salt.

Which two processes are used to individually separate the insoluble chalk from the soluble salt and from the water?

- A** distillation and chromatography
- B** distillation and crystallisation
- C** filtration and chromatography
- D** filtration and crystallisation

15 Which statement about isotopes of the same element is correct?

- A** They have the same number of protons but different number of electrons.
- B** They have the same number of protons but different number of neutrons.
- C** They have the same number of neutrons but different number of electrons.
- D** They have the same number of neutrons but different number of protons.

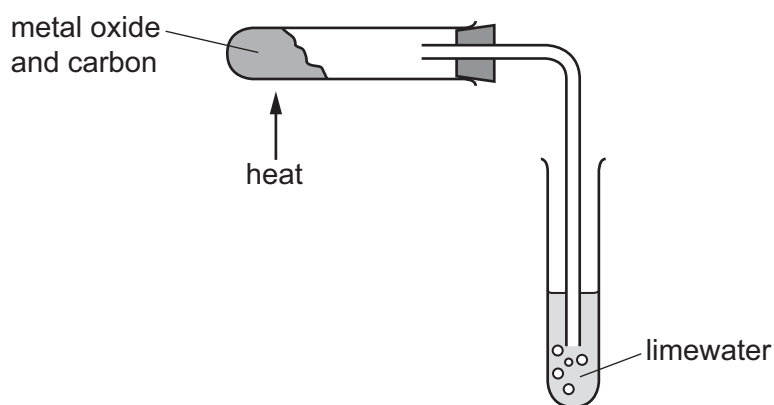
16 Which equation represents the reaction between aluminium and oxygen?

- A** $2Al + 3O \rightarrow Al_2O_3$
- B** $Al_2 + 3O \rightarrow Al_2O_3$
- C** $2Al_2 + 3O_2 \rightarrow 2Al_2O_3$
- D** $4Al + 3O_2 \rightarrow 2Al_2O_3$

17 Which substance does **not** undergo electrolysis?

- A aqueous copper chloride
- B copper wire
- C dilute sulfuric acid
- D molten lead(II) bromide

18 To extract a metal from its ore, a metal oxide is mixed with carbon and heated as shown.

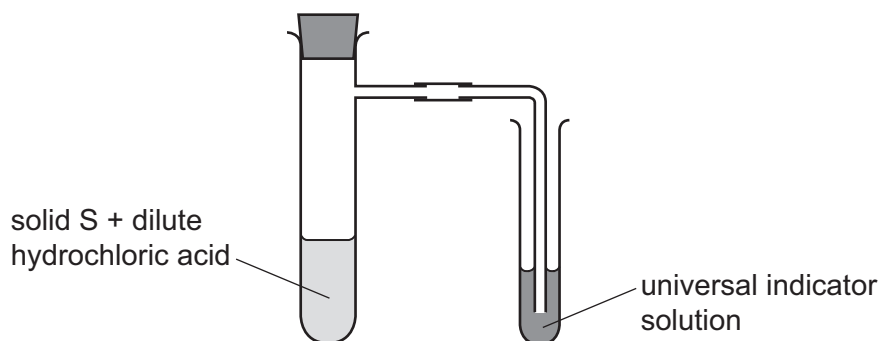


The limewater turns cloudy.

Which term describes what happens to the metal oxide?

- A combustion
- B neutralisation
- C oxidation
- D reduction

19 Solid S is added to dilute hydrochloric acid in the apparatus shown.



The universal indicator solution shows the pH decreases.

What is solid S?

- A zinc
- B zinc carbonate
- C zinc hydroxide
- D zinc oxide

20 Which substance is a basic oxide?

- A calcium oxide
- B carbon dioxide
- C nitrogen dioxide
- D sulfur dioxide

21 Which statements about the halogens are correct?

- 1 They are diatomic metals.
- 2 Their atoms have seven outer-shell electrons.
- 3 Going down the group, they change from solid to liquid to gas.
- 4 Going down the group, they become darker in colour.

- A 1 and 2 B 1 and 3 C 2 and 4 D 3 and 4

22 Which statement explains why argon is used to fill lamps?

- A It is a gas.
- B It is colourless.
- C It is reactive.
- D It is unreactive.

- 23** Aluminium is a1..... resource. It is found in the ore bauxite where it is present in aluminium oxide.

Pure aluminium is extracted from aluminium oxide by2..... .

Which words complete gaps 1 and 2?

	1	2
A	finite	electrolysis
B	finite	heating with carbon
C	renewable	electrolysis
D	renewable	heating with carbon

- 24** Which gas is an air pollutant?

- A** argon
- B** carbon dioxide
- C** nitrogen
- D** sulfur dioxide

- 25** Which word equation describes the manufacture of lime from limestone?

- A** calcium carbonate $\rightarrow$ calcium hydroxide + carbon dioxide
- B** calcium carbonate $\rightarrow$ calcium oxide + carbon dioxide
- C** calcium hydroxide $\rightarrow$ calcium oxide + water
- D** calcium oxide + carbon dioxide $\rightarrow$ calcium carbonate

- 26** Which process is used to separate petroleum into useful products?

- A** cracking
- B** filtration
- C** fractional distillation
- D** thermal decomposition

27 Polymers are long chain molecules made from smaller molecules.

What are these smaller molecules called?

- A alkanes
- B atoms
- C components
- D monomers

28 Which row gives the units for mass m and gravitational field strength g ?

	mass m	gravitational field strength g
A	kg	N/kg
B	kg	kg/N
C	N	N/kg
D	N	kg/N

29 A solid, rectangular piece of wood measures $8.0\text{ m} \times 1.0\text{ m} \times 0.10\text{ m}$. The block has a mass of 440 kg.

What is the density of the wood?

- A 55 kg/m^3 B 352 kg/m^3 C 550 kg/m^3 D 3520 kg/m^3

30 The weight of a box exerts pressure on the ground.

Which pair of changes to the box **must** reduce the pressure?

- A decreasing the weight and decreasing the area of the base
- B decreasing the weight and increasing the area of the base
- C increasing the weight and decreasing the area of the base
- D increasing the weight and increasing the area of the base

- 31** A horizontal force acts on a block.

The block moves in the direction of the force.

Which two quantities affect the work done by the force on the block?

- A** magnitude of force and distance moved
- B** magnitude of force and mass of block
- C** magnitude of force and volume of block
- D** magnitude of force and weight of block

- 32** A gas is contained in a cylinder of constant volume.

The gas is cooled.

What happens to the speed of the molecules of the gas and to the pressure of the gas?

	speed of molecules	pressure of gas
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 33** Which statement about the relative thermal expansion of solids, liquids and gases is correct?

- A** Solids expand least, gases expand most.
- B** Solids expand least, liquids expand most.
- C** Gases expand least, liquids expand most.
- D** Gases expand least, solids expand most.

- 34** The amplitude of a sound wave increases, and the frequency of the wave decreases.

What is the effect on the loudness of the sound and on the pitch of the sound?

	loudness	pitch
A	greater	higher
B	greater	lower
C	less	higher
D	less	lower

35 A plastic rod is rubbed with a cloth. The rod becomes positively charged.

Which statement describes why this happens?

- A** Electrons move from the cloth to the rod.
- B** Electrons move from the rod to the cloth.
- C** Protons move from the cloth to the rod.
- D** Protons move from the rod to the cloth.

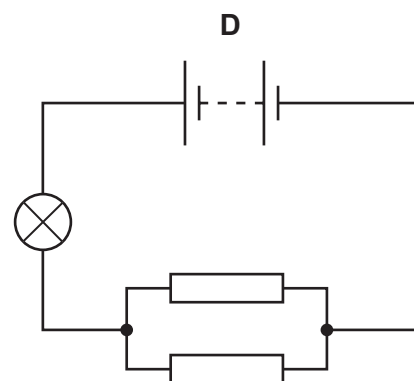
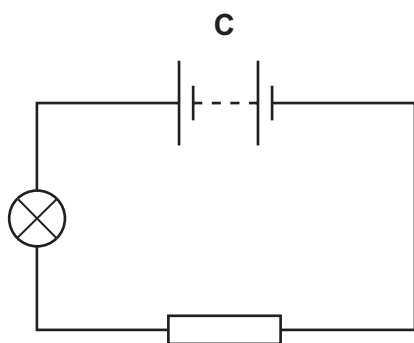
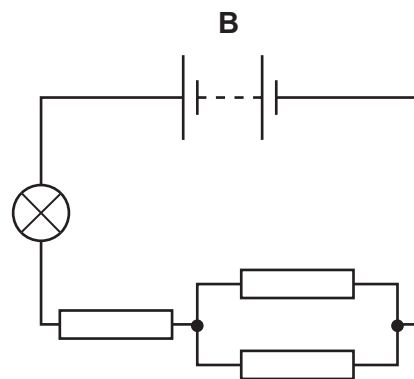
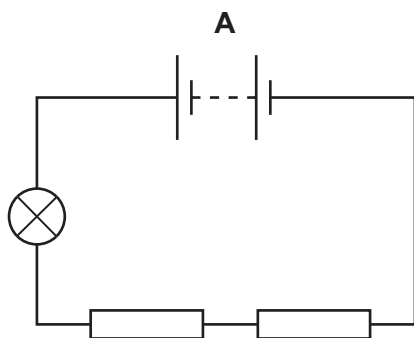
36 What is a current in a metal wire?

- A** a flow of electrons
- B** a flow of ions
- C** a flow of neutrons
- D** a flow of protons

37 A lamp is connected in four circuits in turn.

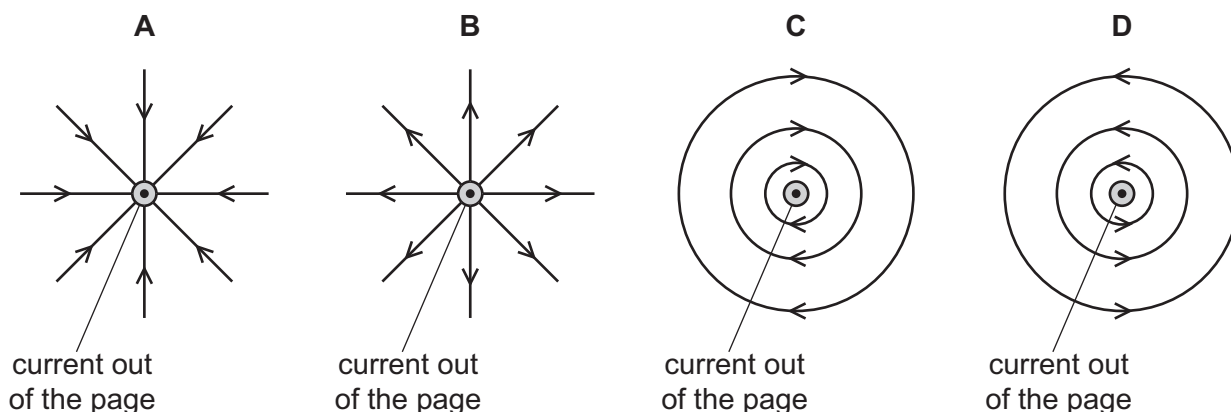
The batteries are identical and the resistors are identical.

In which circuit is the lamp the brightest?



38 The diagrams show a wire carrying a current out of the page.

Which diagram shows the pattern of magnetic field lines near the wire?



39 Which row describes the relative ionising effect and the relative penetrating ability of alpha and gamma radiation?

	relative ionising effect	relative penetrating ability
A	alpha is more ionising	alpha is more penetrating
B	alpha is more ionising	gamma is more penetrating
C	gamma is more ionising	alpha is more penetrating
D	gamma is more ionising	gamma is more penetrating

40 A radioactive isotope has a half-life of 4.0 days. A sample of the isotope emits radiation at a rate of 100 emissions per minute.

What was the rate of emission from the sample 8.0 days earlier?

- A** 25 emissions per minute
- B** 50 emissions per minute
- C** 200 emissions per minute
- D** 400 emissions per minute

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The Periodic Table of Elements

Group

I	II	Key										III	IV	V	VI	VII	VIII	
		atomic number atomic symbol name relative atomic mass																
1 H hydrogen 1																		
3 Li lithium 7	4 Be beryllium 9																	
11 Na sodium 23	12 Mg magnesium 24																	
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84	
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium —	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131	
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium —	85 At astatine —	86 Rn radon —	
87 Fr francium —	88 Ra radium —	89–103 actinoids	104 Rf rutherfordium —	105 Db dubnium —	106 Sg seaborgium —	107 Bh bohrium —	108 Hs hassium —	109 Mt meitnerium —	110 Ds darmstadtium —	111 Rg roentgenium —	112 Cn copernicium —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganeson —	
lanthanoids																		
57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium —	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175				
actinoids																		
89 Ac actinium —	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium —	94 Pu plutonium —	95 Am americium —	96 Cm curium —	97 Bk berkelium —	98 Cf californium —	99 Es einsteinium —	100 Fm fermium —	101 Md mendelevium —	102 No nobelium —	103 Lr lawrencium —				

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).